What is claimed is

1. An image processing apparatus for performing image processing on image data, comprising:

means for acquiring an image file that contains the image data and for acquiring use information associated with said image file, said use information being indicative of whether out of gamut information for a predetermined color space is to be used in performing image processing on the image data;

means for analyzing the use information and deciding whether to use the out of gamut information for said predetermined color space; and

means for performing image processing on said image data, including means for performing color conversion of said out of gamut information to a wide gamut color space when the means for analyzing decides to use said out of gamut information, wherein a gamut of the wide gamut color space is sufficiently large to accommodate the image data associated with the out of gamut information.

2. An image processing apparatus according to claim 1, wherein:

said means for performing color conversion performs image processing of said image data via a pre-established color space having a gamut equivalent to that of said predetermined color space when the means for analyzing decides not to use said out of gamut information.

3. An image processing apparatus according to claim 1, wherein:

said image data contained in said image file is defined in a first color space;

said means for acquiring includes means for converting the image data contained in the image file from said first color space to a second color space; and

said means for performing color conversion converts the image data in said second color space to a third color space using said out of gamut information.

4. An image processing apparatus according to claim 1, wherein:

said image data contained in said image file is produced to fall within a first color space and includes

first positive color representation values that are color representation values lying within a gamut of said predetermined color space,

second positive color representation values, and

negative color representation values that are color representation values lying outside the gamut of said predetermined color space; and said means for acquiring includes

5   means for converting the color space of said image data from said first color space to a second color space by processing said negative color values and at least one of said first positive color representation values and said second positive color representation values.

10   5. An image processing apparatus according to claim 4, wherein:

said means for performing image processing includes means for correcting gamma information in said image data using a first gamma correction value when said image data contains said at least one of said first and said second positive color representation values, and using a second

15   gamma correction value that is different from said first gamma correction value when said image data contains negative color representation values.

     6. An image processing apparatus according to claim 5, wherein:

said first color space is an RGB color space having a R component, a G component,

20   and a B component; and

said second gamma correction value includes different component values for each of said R component, said G component, and said B component.

     7. An image processing apparatus according to Claim 3, wherein:

25   said means for converting the image data contained in the image file from said first color space to a second color space includes means for performing a first matrix operation on image data represented by said first color space, and

said means for performing color conversion converts the image data in said second color space to a third color space includes means for performing a second

30   matrix operation on image data represented by said second color space.

     8. An image processing apparatus for performing image processing on image data, comprising:

means for acquiring an image file that contains the image data, said image data is represented in a first color space and includes

first positive color representation values that are color representation values lying within a gamut of a predetermined color space, and

at least one of second positive color representation values and negative color representation values that are color representation values lying outside the color gamut of said predetermined color space; and

means for performing color conversion of said image data using said first positive color representation values, and said at least one of said second positive color representation values and negative color representation values to convert said image data from said first color space to a second color space which is wider than said predetermined color space and has a color gamut that contains said at least one of said second positive color representation values and said negative color representation values.

9. An image processing apparatus according to claim 8, further comprising: means for performing gamma correction of said image data using

a first gamma correction value where said image data contains said first and second positive color representation values, and

a second gamma correction value different from said first gamma correction value where said image data contains negative color representation values.

10. A computer program product, comprising:

a computer storage medium; and

a computer program code mechanism embedded in said computer storage medium for causing a computer to process an image file from an image output device, said image file containing image data and use information associated with the image data, the use information being indicative of whether out of gamut information for a predetermined color space is to be used in image processing of the image data, the computer program code mechanism having

a first computer code device configured to acquire said image file and the use information,

a second computer code device configured to analyze the use information and decide whether to use color representation values lying outside the gamut of said predetermined color space in subsequent operations where the image data is subjected to image processing,

a third computer code device configured to perform image processing on the image data, and configured to perform color conversion of said out of gamut information to a wide color space that is sufficiently large to accommodate image data associated with the out of gamut information, and

a fourth computer code device configured to output said image data after the third computer code device has performed the color conversion of the out of gamut information.

11. A computer program product according to claim 10, wherein:

said image data contained in said image file is represented by a first color space and includes

first positive color representation values that are color representation values lying within the gamut of said predetermined color space, and

at least one of second positive color representation values and negative color representation values that are color representation values lying outside the color gamut of said predetermined color space, wherein

said second computer code device being configured to convert said image data from said first color space to said second color space using said first positive color representation values and at least one of said second positive color representation values and said negative color representation values.

12. A computer program product according to claim 11, wherein:

said third computer code device is configured to perform gamma correction on said image data using

a first gamma correction value where said image data contains said first positive color representation values, and

a second gamma correction value different from said first gamma correction value where said image data contains negative color representation values.

13. A device for generating an image file that contains image data and image processing control information for subsequent image processing of the image data, comprising:

5   means for generating said image data;

means for generating image processing control information, said image processing control information including use information that is indicative of whether out of gamut information for a predetermined color space is to be used in performing image processing on said image data; and

10   means for generating an image file that contains said image data and said image processing control information.

14. A device for generating an image file according to claim 13, further comprising:

15   means for conveying said image file to another device via at least one of a removable memory card, a wired communication link, and a wireless communication link.

15. A device for generating an image file according to claim 13, wherein:

20   the means for generating the image data being at least one of a DSC, DVC and a scanning device.

16. A device for generating an image file according to claim 13, wherein:

said means for generating the image file is configured to arrange said image

25   file as an Exif file, and arrange said image processing control information in a Makernote portion of the Exif file.

17. A device for generating an image file that contains image data and image processing control information that is indicative of image processing conditions for

30   subsequent processing of the image data, comprising:

means for generating image data that includes

first positive color representation values which are color representation values lying within a gamut of a predetermined color space, and

at least one of second positive color representation values and negative color representation values that are color representation values lying outside the gamut of said predetermined color space; and

means for generating image processing control information that includes

5   use information indicating whether at least one of said second positive color representation values and negative color representation values are part of the image data to be processed,

a first gamma correction value for use with image data containing at least one of said first second positive color representation value and said

10   second positive color representation value, and

a second gamma correction value, different from said first gamma correction value, for use with image data that contains negative color representation values.

15   18. A device for generating an image file according to claim 17, wherein:

said image processing control information further includes color space conversion characteristics for performing color space conversion of said image data to a color space that is wider than said predetermined color space and that has a sufficiently wide gamut to include said at least one of said second color

20   representation values and said negative color representation values.

19. A method for outputting an image file with image data represented by a first color space, comprising steps of:

acquiring the image file that contains the image data and acquiring use

25   information associated with said image file, said use information being indicative of whether out of gamut information for a predetermined color space is to be used in performing image processing on the image data;

converting from a first color space to a second color space;

analyzing the use information and deciding whether to use the out of gamut

30   information for representing the image data in said predetermined color space;

converting the image data from the second color space to a third color space when in said analyzing the use information step it is decided that said out of gamut information is to be used to convert the color space of image data represented by

said second color space to said third color space; and

outputting said image data after the image data is converted into said third color space.

5   20. A method according to Claim 19, wherein:

said first color space is a YCbCr color space;

said second color space is a first RGB color space; and

said third color space is a second RGB color space having a gamut wider than said first RGB color space.

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21. A method according to Claim 20, wherein:

said second color space is a sRGB color space.

22. A method according to Claim 21, wherein:

15   said first color space is a YCbCr color space;

said second color space is a first RGB color space; and

said third color space is a CIELAB color space.

23. A method according to Claim 19, wherein:

20   said image data contained in said image file is produced in a first color space and includes

first positive color representation values that are color representation values lying within a gamut of said predetermined color space,

second positive color representation values, and

25   negative color representation values that are color representation values lying outside the gamut of said predetermined color space; and said acquiring step includes

converting the color space of said image data from said first color space to a second color space by processing said negative color values and

30   at least one of said first positive color representation values and said second positive color representation values.

24. A method according to Claim 19, further comprising:

correcting gamma information in said image data using a first gamma correction value when said image data contains said at least one of said first and second positive color representation values, and using a second gamma correction value that is different from said first gamma correction value when said image data contains negative color representation values.

25. A method according to Claim 19, wherein:

said second gamma correction value is smaller than said first gamma correction value.

26. A method according to Claim 22, wherein:

said first color space is an RGB color space having a R component, a G component, and a B component; and

said second gamma correction value includes different component values for each of said R component, said G component, and said B component.

27. A method according to Claim 19, further comprising:

performing a first matrix operation on image data represented by said first color space; and

performing a second matrix operation on image data represented by said second color space.

28. A method according to Claim 19, wherein:

said outputting step includes printing onto a print medium said image data.

29. A method for outputting image data, comprising steps of:

acquiring said image data represented by a first color space;

converting the image data from said first color space to a second color space;

holding information about the image data that is contained in the second color space after the converting step, and holding information about the image data that falls outside a gamut of said second color space;

converting the image data to a third color space using the information held about the image data that falls outside the gamut of the second color space; and

outputting said image data after said converting step.

30. A method for outputting image data according to claim 29, wherein:

information about the image data contained in the gamut of said second color
5   space is expressed as first positive gamut values, and information about the image
data that falls outside the gamut defining said second color space is expressed as
second positive values that either exceed said first positive gamut values or are
negative gamut values.

10   31. A method for outputting image data according to claim 30, further
comprising:

    performing gamma correction on said image data using

        a first gamma correction value where said image data contains said
first positive gamut values, and

15   a second gamma correction value different from said first gamma
correction value where said image data contains negative gamut values.

32. A method for processing image data, comprising steps of:

    acquiring image data represented by a first color space and converting the
20   image data from said first color space to said second color space;

    holding information about the image data that is contained within a gamut of
the second color space, and information about the image data that falls outside the
gamut of said second color space; and

    converting the image data to a third color space using the information about
25   the image data that falls outside the gamut of the second color space, wherein said
third color space has a wider gamut than said second color space so the image data
is fully represented in the third color space.

33. An image processing apparatus for performing image processing on
30   image data, comprising:

    an image file acquisition mechanism configured to acquire an image file that
contains the image data and acquires use information associated with said image
file, said use information being indicative of whether out of gamut information for a

predetermined color space is to be used in performing image processing on the image data;

a processor configured to analyze the use information and determine whether to use the out of gamut information for said predetermined color space; and

an image processor configured to perform color conversion of said out of gamut information to a wide gamut color space when the processor decides to use said out of gamut information, wherein a gamut of the wide gamut color space is sufficiently large to accommodate the image data associated with the out of gamut information.

34. An image processing apparatus according to claim 33, wherein:

said processor is configured to perform image processing of said image data via a pre-established color space having a gamut equivalent to that of said predetermined color space.

35. An image processing apparatus according to claim 33, wherein:

said image data contained in said image file is defined in a first color space;

said image file acquisition mechanism is configured to convert the image data contained in the image file from said first color space to a second color space; and

said image processor is configured to convert the image data in said second color space to a third color space using said out of gamut information.

36. An image processing apparatus according to claim 35, wherein:

said first color space is a YCbCr color space;

said second color space is a first RGB color space; and

said third color space is a second RGB color space having a gamut wider than said first RGB color space.

37. An image processing apparatus according to claim 36, wherein:

said second color space is a sRGB color space.

38. An image processing apparatus according to claim 35, wherein:

said first color space is a YCbCr color space;

said second color space is a first RGB color space; and

said third color space is a CIELAB color space rather than a second RGB color space.

5   39. An image processing apparatus according to claim 33, wherein:

said image data contained in said image file is produced to fall within a first color space and includes

first positive color representation values that are color representation values lying within a gamut of said predetermined color space,

10   second positive color representation values, and

negative color representation values that are color representation values lying outside the gamut of said predetermined color space; and

said image file acquisition mechanism includes

a conversion mechanism configured to convert the color space of said

15   image data from said first color space to a second color space by processing said negative color values and at least one of said first positive color representation values and said second positive color representation values.

39. An image processing apparatus according to claim 39, wherein:

20   said image processor includes a mechanism for correcting gamma information in said image data using a first gamma correction value when said image data contains said at least one of said first and second positive color representation values, and using a second gamma correction value that is different from said first gamma correction value when said image data

25   contains negative color representation values.

41. An image processing apparatus according to claim 40, wherein:

said second gamma correction value is smaller than said first gamma correction value.

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42. An image processing apparatus according to claim 39, wherein:

said conversion mechanism is configured to convert said image data represented by said second color space and including said first positive color

representation values, said second positive color representation values and said negative color representation values to a third color space that is wider than said second color space and whose gamut includes at least one of said second positive color representation values and said negative color representation values.

43. An image processing apparatus according to claim 40, wherein:

said first color space is an RGB color space having a R component, a G component, and a B component, and

said second gamma correction value includes different component values for each of said R component, said G component, and said B component.

44. An image processing apparatus according to Claim 35, wherein:

said image file acquisition mechanism is configured to perform a first matrix operation on image data represented by said first color space; and

said image processor is configured to perform a second matrix operation on image data represented by said second color space.

45. An image processing apparatus according to claim 33, further comprising:

a printer configured to print an image on a recording medium after the image data is processed by said image processor.

46. An image processing apparatus for performing image processing on image data, comprising:

an image file acquisition mechanism configured to acquire an image file that contains the image data, said image data is represented by a first color space and includes

first positive color representation values that are color representation values lying within a gamut of a predetermined color space, and

at least one of second positive color representation values and negative color representation values that are color representation values lying outside the color gamut of said predetermined color space; and

an image processor configured to perform color conversion of said image

data using said first positive color representation values, and said at least one of said second positive color representation values and negative color representation values to convert said image data from said first color space to a second color space, wherein

5   said second color space is wider than said predetermined color space and has a color gamut that contains said at least one of said second positive color representation values and said negative color representation values.

47. An image processing apparatus according to claim 46, further
10 comprising:

a gamma correction mechanism configured to perform gamma correction of said image data using

a first gamma correction value where said image data contains said first and second positive color representation values, and
15   a second gamma correction value different from said first gamma correction value where said image data contains negative color representation values.

48. An image processing apparatus according to claim 46, further
20 comprising:

a printer configured to print an image on a print medium based on said image data, after said image data is processed by said image processor.

49. A device for generating an image file that contains image data and image
25 processing control information for image processing of the image data, comprising:

a data acquisition mechanism configured to arrange image data in the image file;

a control information generation mechanism configured to generate process control information that includes use information that is indicative of whether out of
30 gamut information for a predetermined color space is to be used in performing image processing on said image data; and

an image file setting mechanism that arranges said image data generated by said data acquisition mechanism and said image processing control information

generated by said control information generation mechanism into the image file in a predetermined file format.

50. A device for generating an image file according to claim 49, wherein:
said image data contained in said image file is defined by a first color space; and

said use information is used in subsequent image processing of said image data to convert said image data from the first color space to a second color space, and then from the second color space to a third color space without using loosing color information originally contained in said image data when acquired by said data acquisition mechanism.

51. A device for generating an image file according to claim 50, wherein:
said first color space is a YCbCr color space;
said second color space is a first RGB color space; and
said third color space is a second RGB color space having a gamut wider than said first RGB color space.

52. A device for generating an image file according to claim 51, wherein:
said second color space is a sRGB color space.

53. A device for generating an image file according to claim 50, wherein:
said first color space is a YCbCr color space;
said second color space is a first RGB color space; and
said third color space is a CIELAB color space.

54. A device for generating an image file according to claim 49, wherein:
said image data contained in said image file is produced to fall within a first color space and includes
first positive color representation values which are color representation values lying within a gamut of said predetermined color space,
second positive color representation values, and
negative color representation values which are color representation

values lying outside the gamut of said predetermined color space; and
said image file setting mechanism includes

a conversion mechanism configured to convert the color space of said
image data from said first color space to a second color space by processing
5   said negative color values and at least one of said first positive color
representation values and said second positive color representation values.

55. A device for generating an image file according to claim 54, wherein:
said process control information includes a first gamma correction
10   value when said image data contains said at least one of said first and
second positive color representation values, and a second gamma correction
value that is different from said first gamma correction value when said image
data contains negative color representation values.

15   56. A device for generating an image file according to claim 55, wherein:
said second gamma correction value is smaller than said first gamma
correction value.

57. A device for generating an image file according to claim 54, wherein:
20   said conversion mechanism is configured to convert said image data
represented by said second color space and including said first positive color
representation values, said second positive color representation values and said
negative color representation values to a third color space that is wider than said
second color space and whose gamut includes at least one of said second positive
25   color representation values and said negative color representation values.

58. A device for generating an image file according to claim 55, wherein:
said first color space is an RGB color space having a R component, a G
component, and a B component, and
30   said second gamma correction value includes different component values for
each of said R component, said G component, and said B component.

59. A device for generating an image file according to claim 49, further

comprising:

a computer readable memory configured to hold the image file and control information.

5   60. A device for generating an image file according to claim 49, wherein: said computer readable memory being a removable memory card.

61. A device for generating an image file according to claim 49, further comprising:

10   an output port coupled said computer readable memory and configured to convey said image file to another device via at least one of a wired connection and a wireless communication link.

62. A device for generating an image file according to claim 49, wherein:

15   the data acquisition mechanism being at least one of a DSC, DVC and a scanning device.

63. A device for generating an image file according to claim 49, wherein: said image file setting mechanism is configured to arrange said image file as

20   an Exif file.

64. A device for generating an image file according to claim 63, wherein: said image file setting mechanism is configured to arrange said image processing control information in a Makernote portion of the Exif file.

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65. A device for generating an image file that contains image data and image processing control information indicating image processing conditions for processing the image data, comprising:

a data acquisition mechanism configured to arrange image data in an image

30   file, said image data includes

first positive color representation values which are color representation values lying within a gamut of a predetermined color space, and

at least one of second positive color representation values and

negative color representation values that are color representation values lying outside the gamut of said predetermined color space; and

an image processing control information setting mechanism configured to set control information regarding a color space and gamma correction values for said image data, said control information including

use information indicating whether at least one of said second positive color representation values and negative color representation values are part of the image data to be processed,

a first gamma correction value for use with image data containing at least one of said first second positive color representation value and said second positive color representation value, and

a second gamma correction value, different from said first gamma correction value, for use with image data that contains negative color representation values.

66. A device for generating an image file according to claim 65, wherein:

said image processing control information further includes color space conversion characteristics for performing color space conversion of said image data to a color space that is wider than said predetermined color space and that has a sufficiently wide gamut to include said at least one of said second color representation values and said negative color representation values.

each of said R component, said G component, and said B component.

67. A device for generating an image file according to claim 65, further comprising:

a computer readable memory configured to hold the image file and control information.

68. A device for generating an image file according to claim 67, wherein:

said computer readable memory being a removable memory card.

69. A device for generating an image file according to claim 68, further comprising:

an output port coupled said computer readable memory and configured to convey said image file to another device via at least one of a wired connection and a wireless communication link.

5   70. A device for generating an image file according to claim 66, wherein:
the data acquisition mechanism being at least one of a DSC, DVC and a scanning device.

71. An image processing apparatus for performing image processing on
10   image data, comprising:
means for acquiring the image data, wherein the image data contains out of gamut information for a predetermined color space;
means for instructing use of the out of gamut information for said predetermined color space; and
15   means for performing image processing on said image data, wherein the image processing includes means for performing color conversion of said out of gamut information to a wide gamut color space when use of the out of gamut information is instructed, wherein a gamut of the wide gamut color space is sufficiently large to accommodate the image data associated with the out of gamut
20   information.

72. An image processing apparatus according to claim 71, wherein the means for performing color conversion performs image processing the image data via a pre-established color space having a gamut equivalent to that of the
25   predetermined color space when use of the out of gamut information is not instructed.